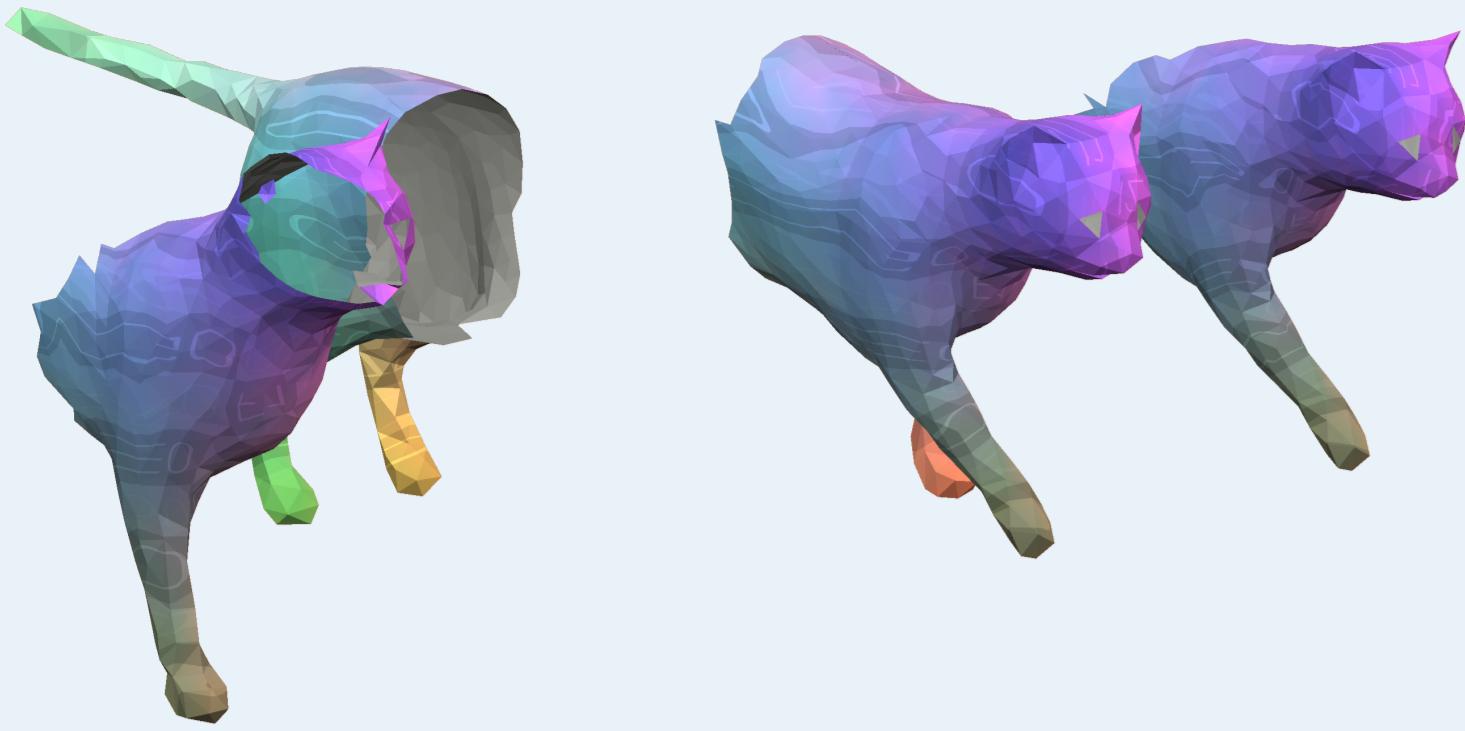


Geometrically Consistent Partial Shape Matching



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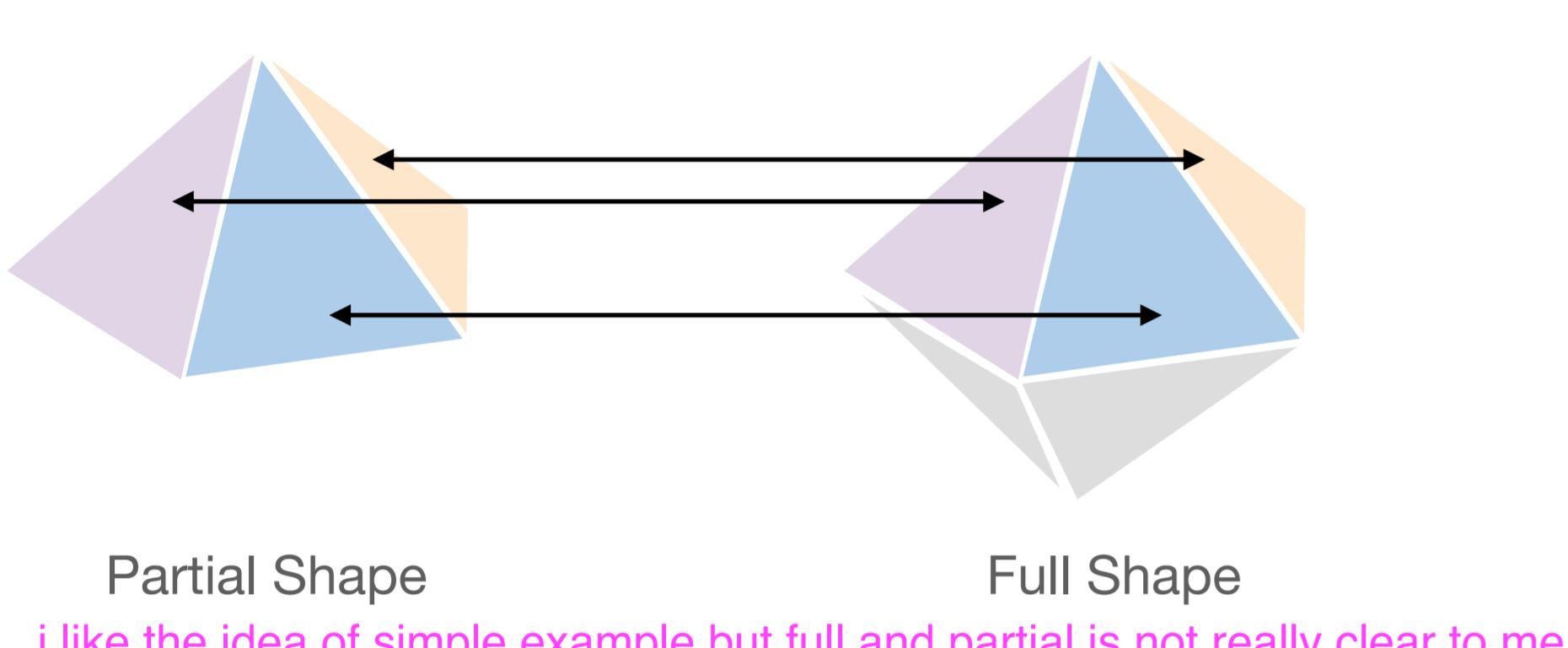
²Munich Center for Machine Learning

³University of Bonn

Problem Formulation

should also work without the marked bullet points

- Find correspondences between a partial shape and a full template shape



i like the idea of simple example but full and partial is not really clear to me visually so maybe use another shape?

- Geometric Consistency: Neighboring triangles are matched on neighboring triangles

Related Work

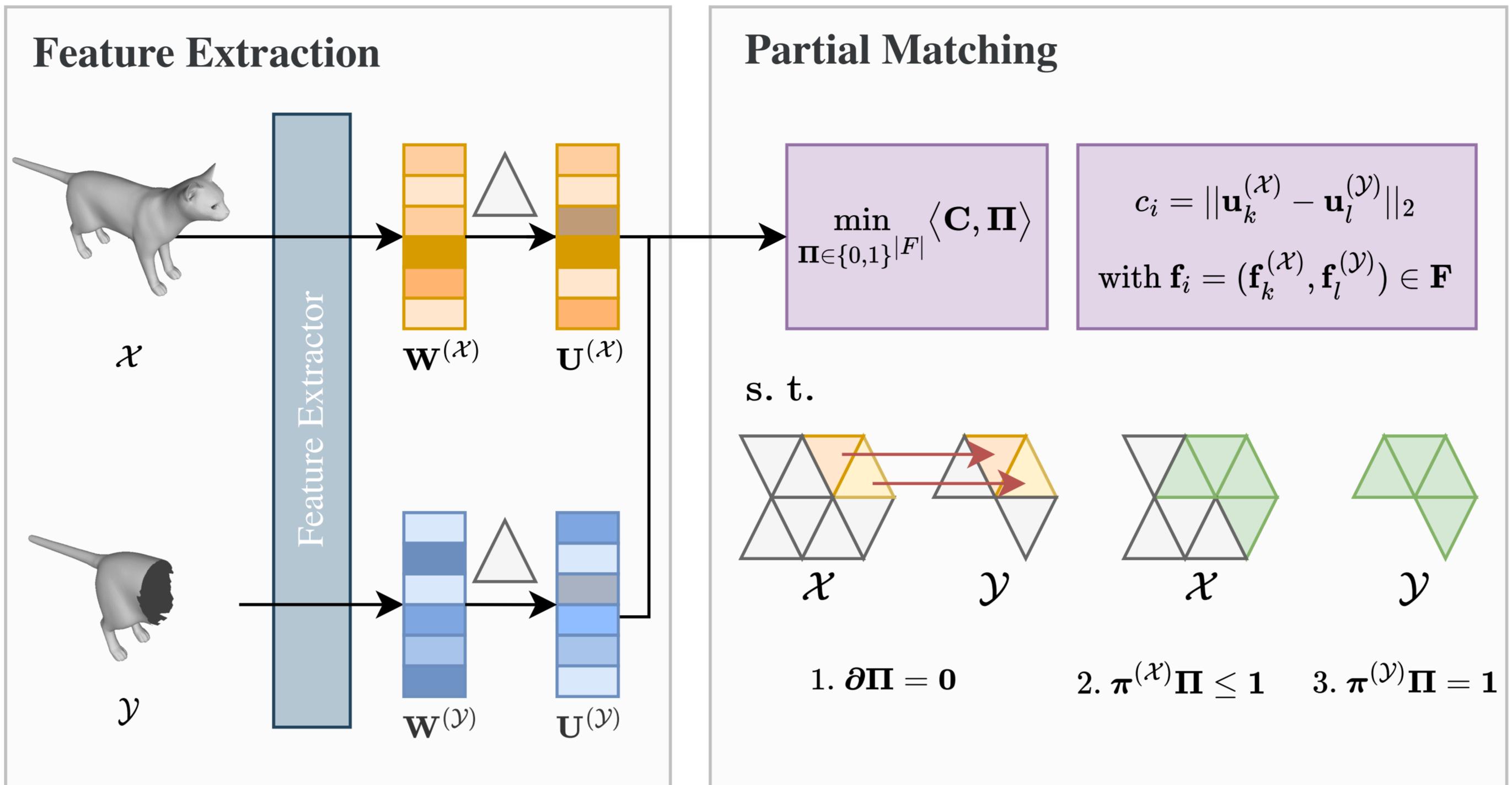
- Cao et al. [1]
 - ✓ SOTA features results
 - ✗ Geometric Consistency
- Windheuser et al. [2] & Roetzer et al. [3]
 - ✓ Geometric Consistency
 - ✗ Handle partial shapes (Holes need to be closed)

Contribution

- Integer Linear Program optimization for partial shape matching with geometrically consistent correspondences
- Iterative coarse-to-fine scheme: Globally optimal low-resolution maps → pruned higher resolution maps
- State-of-the-art performance regarding smoothness and accuracy in partial matching



Our Method

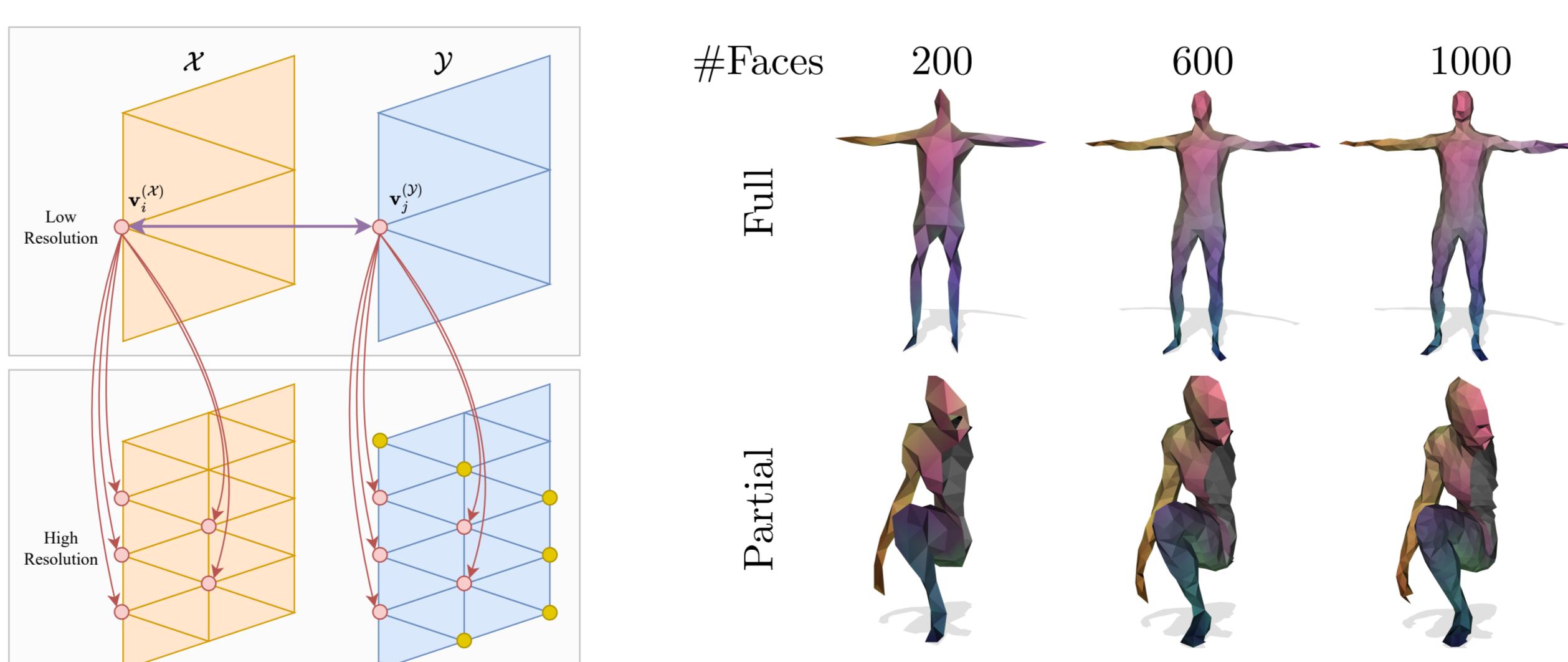


- Extract triangle-wise feature from SOTA feature extractor

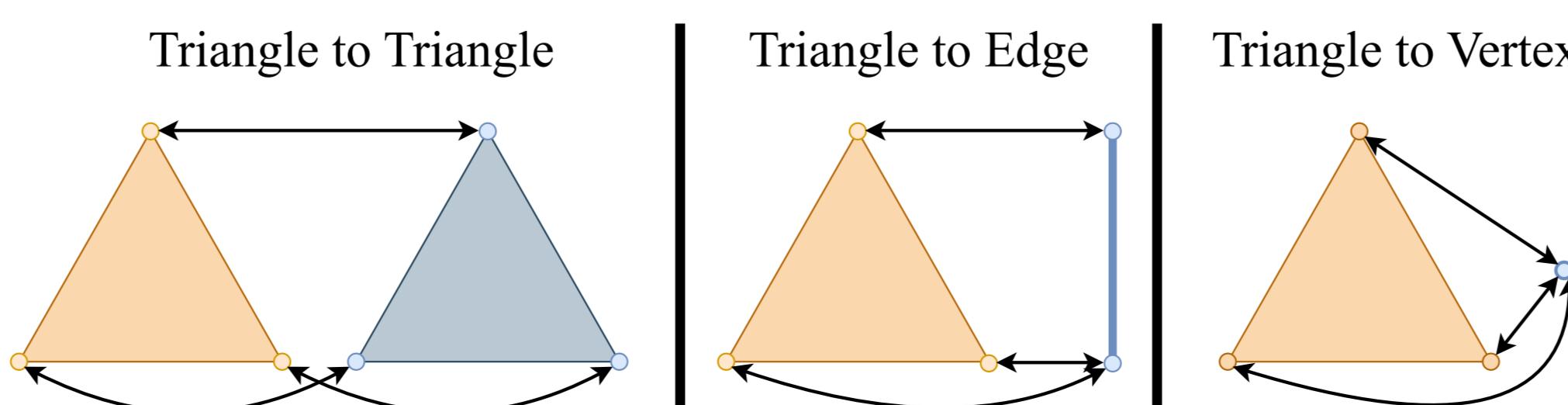
- Formulate Integer Linear Program constraining

1. **Geometric Consistency**
triangles of full shape
2. **Full shape triangles** are matched at most once
triangles of partial shape
3. **Partial shape triangles** are matched exactly once

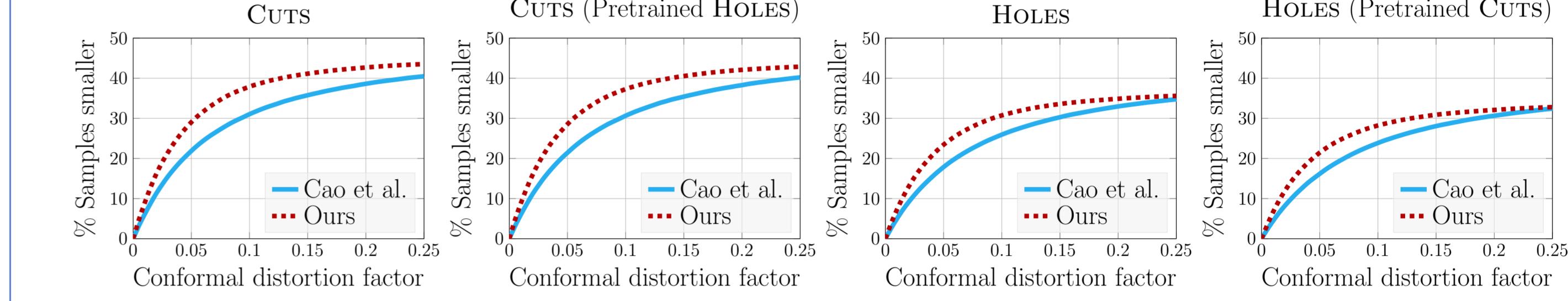
Coarse-to-Fine Scheme



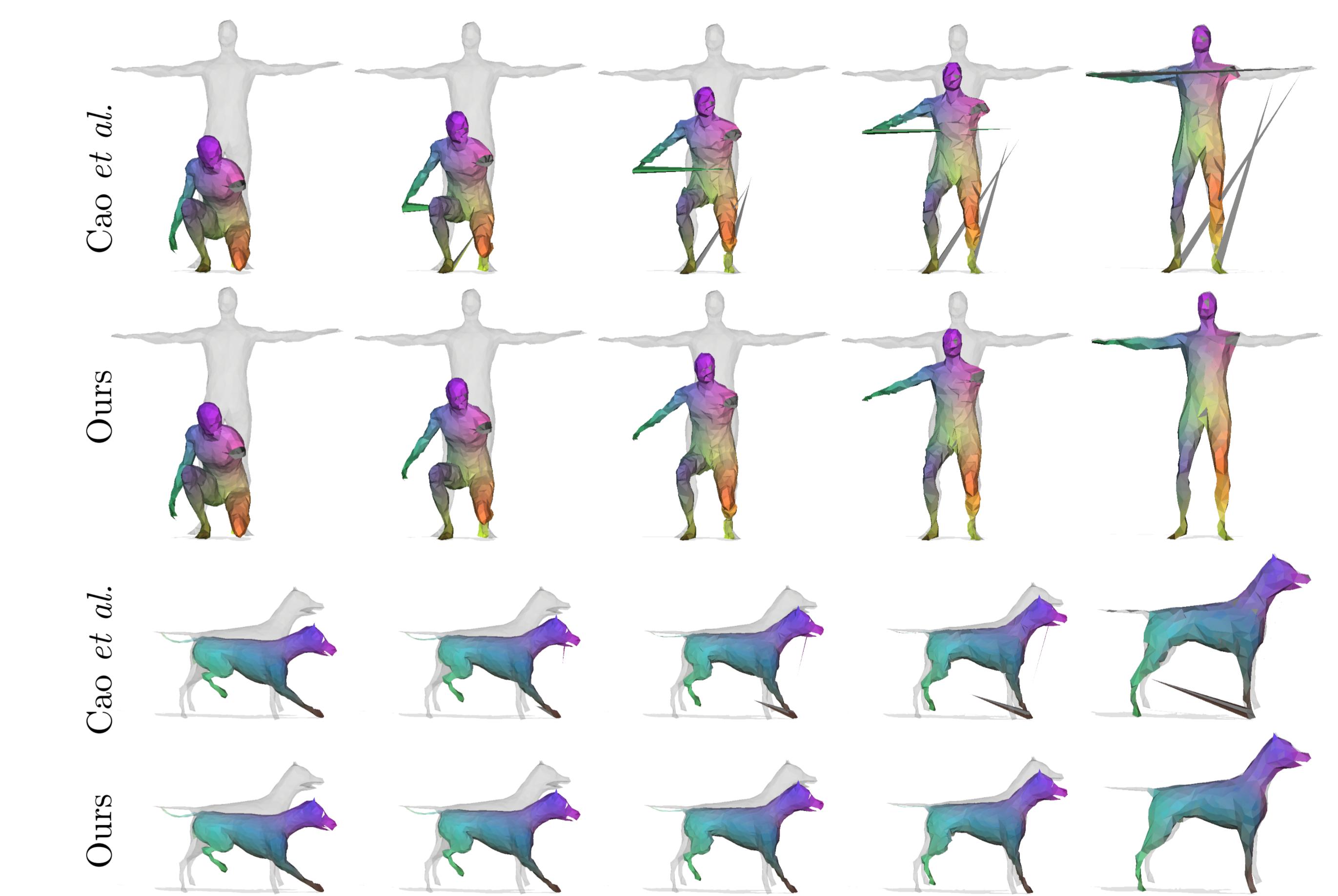
Product Space



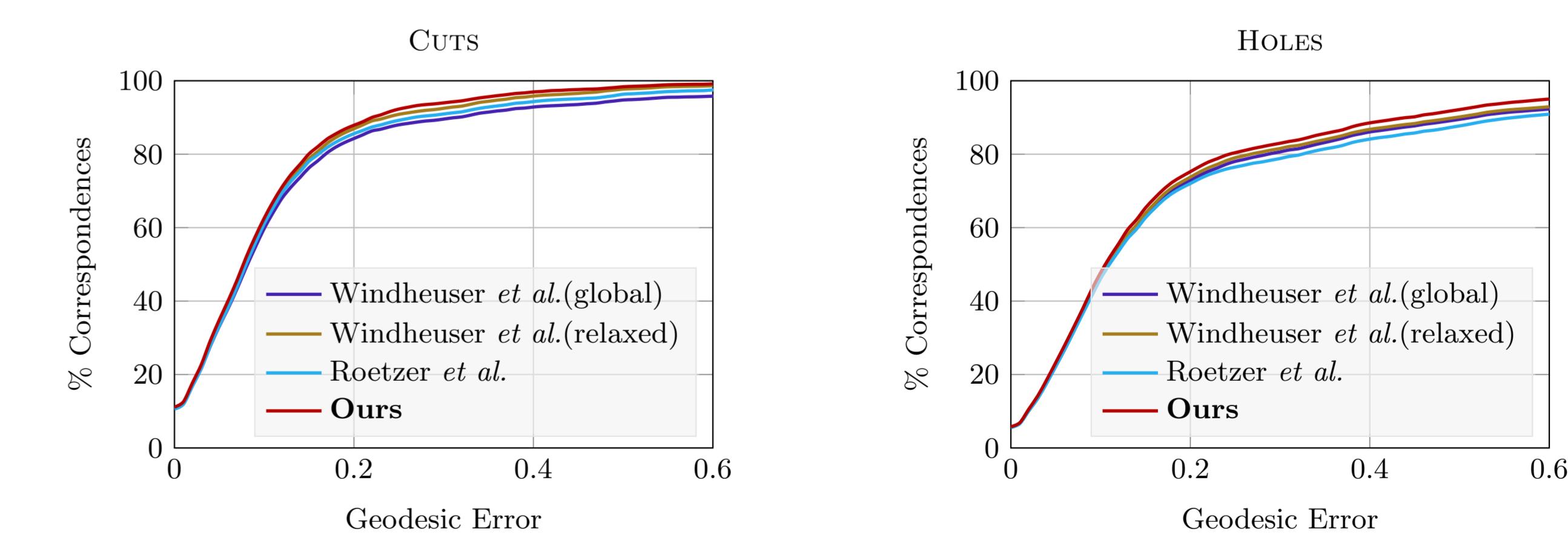
Results - Smoothness



Results - Interpolation



Results - Accuracy



References:

- [1] Dongliang Cao, Paul Roetzer, and Florian Bernard. Unsupervised learning of robust spectral shape matching. *ACM Transactions on Graphics (TOG)*, 2023.
- [2] Thomas Windheuser, Ulrich Schlickerwei, Frank R Schmidt, and Daniel Cremers. Geometrically consistent elastic matching of 3d shapes: A linear programming solution. *ICCV*, 2011.
- [3] Paul Roetzer, Paul Swoboda, Daniel Cremers, and Florian Bernard. A scalable combinatorial solver for elastic geometrically consistent 3d shape matching. *CVPR*, 2022

